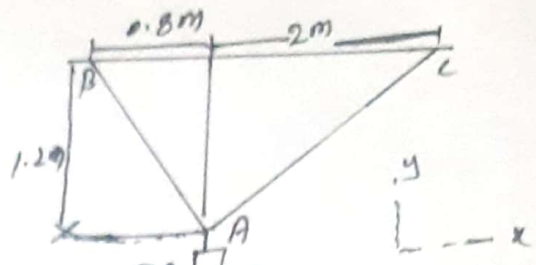
Question No 1 part-A

Given data



$m = 400$ lbs

increase of volume $\Rightarrow \eta_{AB} = 15\%$

increas of volume $\Rightarrow \eta_{AC} = 35\%$

Required

$AB = ?$

$BC = ?$

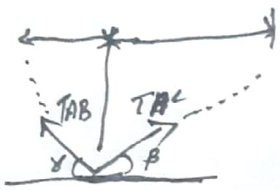
Solution

$\gamma = \tan^{-1}\left(\frac{1.2}{0.8}\right)$

$\gamma = 56.3°$

$\beta = \tan^{-1}\left(\frac{1.2}{2}\right)$

$\beta = 31.0°$



we know that

~~$T_{AB} = T_{AB}\,\eta_{AB} = 0.15$~~

$m = 400$ lbs $\Rightarrow 400/2.204 = 181.48$ kg

$T_{AB} = T_{AB}\,\eta_{AB} = 0.15 \times (181.48)(9.81)\left[-\cos 56.3\,i + \sin 56.3\,j\right]$

$= 267.047\{-0.55\,i + 0.831\,j\}$

$(T_{AB} = -146.87\,i + 221\,j\ N)$

(P.T.O)

$$T_{AC} = T_{AC} n_{AC} = 0.35(181.48) \times (0.81)\left\{-\cos 31 i + \sin 31 j\right\}$$

$$T_{AC} = (623.11)\left\{-0.857 i + 0.515 j\right\}$$

$$T_{AC} = \cancel{-320 i +}$$

$$T_{AC} = -534 i + \cancel{820} 320 j \text{ N}$$

$$T_{AB} = -146 i + 221 j \text{ N}$$

$$T_{AC} = -534 i + 320 j \text{ N}$$

part B

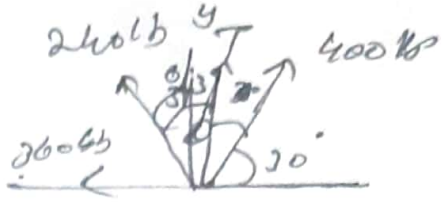
If the water tank increase their weight is % then stability is no durable.

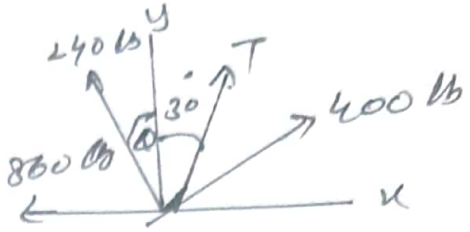
Question 2

Ans

Given data

Effect of both = 600 lb





Required

$T = ?$

$\theta = ?$

Sol

$$\Sigma F_x = 0 = -360 - 240\sin\theta + T\sin 30 + 400\cos 30 = 0$$

$$\Sigma F_y = 0 = 240\cos\theta + T\cos 30^\circ + 400\sin 30 = 600$$

Numerical Solution of Equation (1) & (2)

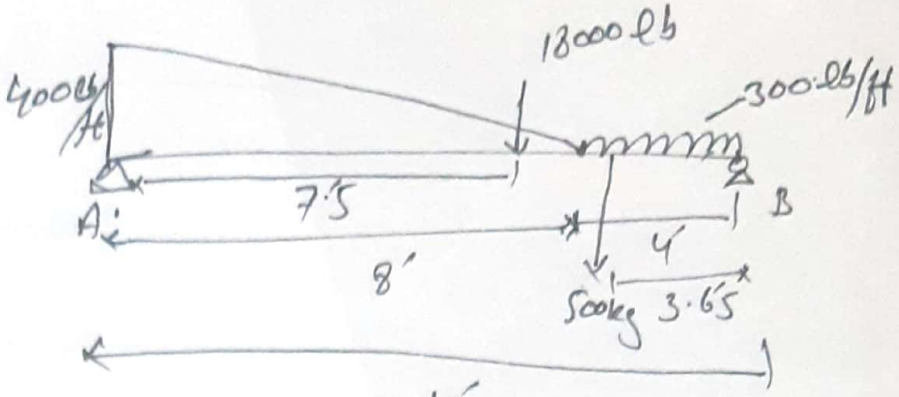
$\theta = 21.7^\circ \quad T = 204$ lb Ans

note: we could eliminate T between Equation 1 & 2 the resulting equation Transcendental.

HW 3

ANS

Geven data



Reqwerd

Ay = ?

By = ?

Solution

⇒ UDL = Convert to point load

⇒ 300 × 4 = 1200 lb

at point = 1/2 × 4 = 2' from B

⇒ UVL = 1/2 × 400 × 8 = 1600 lb

at distance = 1/3 × 8 = 2.66' from A

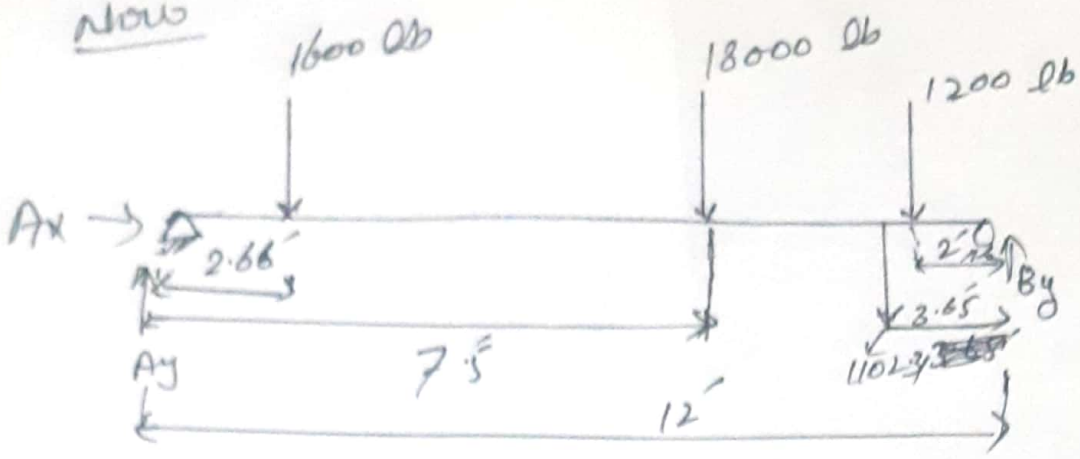
⇒ one load in kg

Convert to lb

= 500 × 2.204 = 1102.31 lb

P.T.O

Now



$\Sigma A_x = 0$

$A_x = 0$

$\Sigma M_A = -1600 \times 2.66 - 18000 \times 7.5 - 1200 \times 10 - 1102.31 \times 3.35 + By \times 12$

$= -4256 - 135000 - 12000 - 9204.28 + By \times 12$

$= -160460.12 + By \times 12$

$By = \frac{160460.12}{12}$

$By = 13371.69$ lb

$Ay = \Sigma$ Total load $- By$

$Ay = 1200 + 1102.31 + 18000 + 1600 - 13371.69$

$Ay = 8530.31$ lb

$Ay = 8530.31$, $By = 13371.69$ Ans